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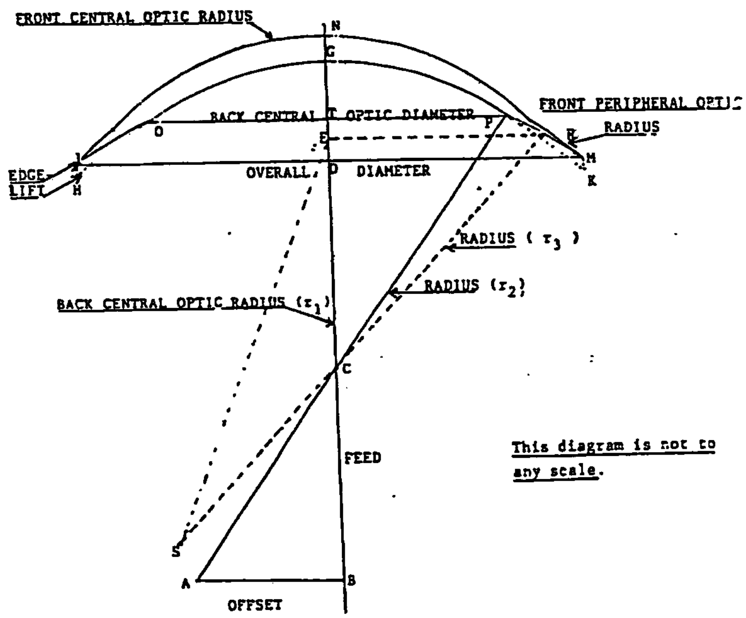
(56) Documents cited

GB A 2139375	GB 1561892	GB 1156454
GB A 2117130	GB 1536891	GB 0939016
GB A 2059102	GB 1433782	US 4525043
GB A 2026715		

(58) Field of search
G2J
Selected US specifications from IPC sub-class G02C

(54) Progressive power contact lens

(57) A progressive power contact lens comprises a distance vision central portion and an aspherical peripheral portion of progressive power.



S - TOTAL SAGITTA OF THE LENS (GD)

S_1 - BACK CENTRAL OPTIC DIAMETER TO OVERALL DIAMETER (TD)

S_2 - MAXIMUM ADDITION OPTIC DIAMETER TO OVERALL DIAMETER (ED) VARIABLE.

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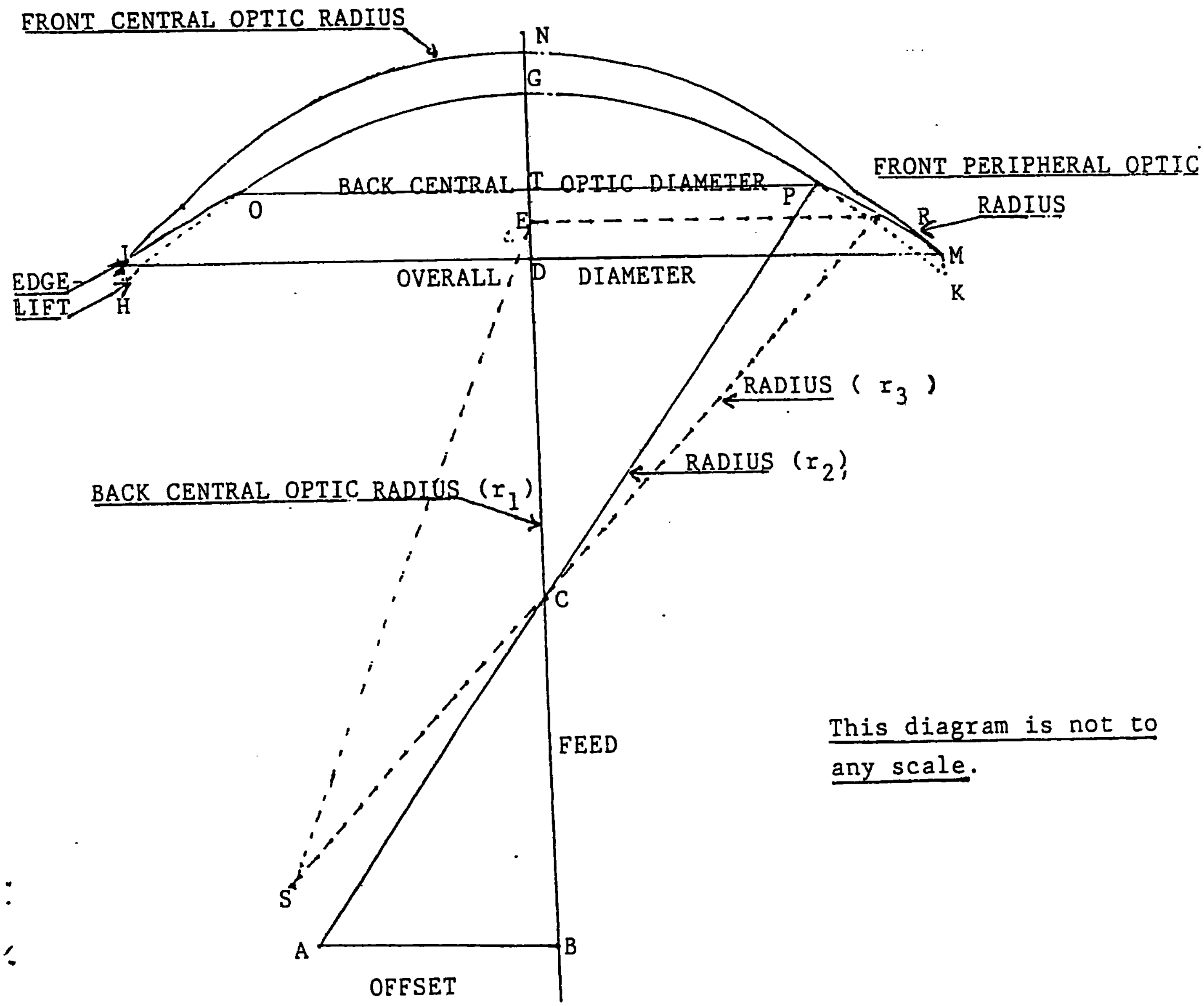

This diagram is not to any scale.

S = TOTAL SAGITTA OF THE LENS (GD)

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SPECIFICATION

Invention of varifocal contact lens.

Contact Lenses has been with us for very long time but to this state all the contact lenses are available either in single vision or in bifocal form. Bifocal forms are mainly of spectacle shape which have proved to be difficult and cumbersome to fit and patient's inability to adapt to them satisfactarily. Eye being very sensitive organ of the human body finds these lenses unacceptable because they insult the cornea and the eye lids.

My invention of varifocal contact lens does not harm the eye in any way. As the enclosed diagrame shows the construction of the contact lens has distance centre portion and peripheral portion of aspheric construction. Aspheric curve has a different radius at every point. The front centre optic radius can be calculated given the following parametres:–

Back centre optic radius
Power of the lens
Centre thickness of the lens
Refractive index of the material

The front peripheral radius is spherical surface which is calculated when the following parametres are known:–

Third peripheral radius at a given point (determined by the fitting of the lens)
Addition power of the lens.
Physical thickness at the point.
Refractive index of the material.

As the back surface is aspherical up to the edge of the back centre optic diametre diameter and the front surface is spherical, of two radii, front central optic radius and front optical prepheral optical radius.

Central portion of the lens will produce distance power while the peripheral radius will produce a different power at every point.

To construct a varifocal lens we need to calculate a set of settings for the lathe. This is best illustrated by flow chart diagrame.

Following prescription is a typical forivarifocal specification

Back cenetral optic radius.
Back Central optic diameter.
Overall diameter.
Edge lift
Power of the lens (distance)
Maximum addition.
Diameter at the point of maximum addition.
Centre thickness of the lens.
Refractive index of the material.

All the above specifications will be needed to calculate the following lathe settings.

Back peripheral radius (r_2)
Off set
Angle
FEED

To calculate the front optic radius the following specifications will be used:–

Back central optic radius.
DISTANCE POWER of the lens.
Centre thickness of the lens.
Refractive index of the material.

To calculate the third radius at the maximum addition point the following data will be used:–

Overall diameter.
Back centre optic diameter.
Second peripheral radius.
Edge lift.
Back central optic radius.

To calculate the front optical peripheral radius the following data is required:–

third radius.
Physical thickness at maximum addition point.
Power of the lens at the point (distance+reading).
Refractive index of the material.

Lathe and Lens Calculations.

$$\text{Edge Lift (E.L.)} = \frac{b^2}{2}\left(\frac{1}{r_1} - \frac{1}{r_2}\right)$$

Where
r_2 is peripheral radius.
b is half of periphery i.e. from the edge of back central optic diameter to the overall diameter.
r_1 is Back Central optic radius.
E.L. is defined as the perpendicular distancefrom the projection of the back centre optic surface to the edge of the lens.

$$\text{OFFSET} = \text{B.C.O.D.}\frac{(r_2 - r_1)}{2r_1}$$

where values r_1 and r_2 are same as above
B.C.O.D. is back central optic diameter.

$$\text{FEED} = (r_2 - r_1)^2 - (\text{OFFSET})^2$$

$$F_1 \text{ (Front central optic radius} = \frac{(1-n)}{r_1} \times 1000.$$

$$f_1 = \frac{1000}{F_1}$$

$$f'_1 = F_1 - \frac{ct}{n}$$

$$F'_r = \frac{1000}{f'_1}$$

$F_2 = F'_1 + \text{B V P}$ (Back vertex power)

$$\text{F.C.O.R.} = \frac{1-n}{F_2}$$

SEE DIAGRAMME.

ANGLE. $\sin\theta = \frac{\frac{1}{2}\text{B.C.O.D.}}{r_1}$

Calculate r_3 (any point on the periphery of the lens to the geometric centre of the lens)
saggita of O.D. with r_2
saggitta of B.C.O.D. with B.C.O.R.
saggitta of B.C.O.D. with r_2
saggitta of max. diameter of the add with r_2.

$$\text{Sag} = r - \sqrt{r^2 - y^2}$$

r is any radius and y is half the diameter.
S (GD) Total sag of the lens=B.C.O.R. on B.C.O.D.+O.D. on r_2−r_2 on B.C.O.D.
S_1 (TD) sag from B.C.O.D. TO O.D.=$r_2$on O.D.−r_2 on B.C.O.D.
S_2 (ED) is variable according to the ,aximum add diameter and must be divided proportionally according to S_1.
$GE = S_3 = S - S_2$

$r_3 = \sqrt{(CE)^2 + (RE)^2}$

To calculate Second front optic peripheral radius,
Distance power+Reading power=Reading R_x

$$F_3 = \frac{(1-n) \times 1000}{r_3}$$

$$f_3 = \frac{1000}{F_3}$$

$$f_3 = \frac{1000}{F'_3}$$

$$f_3 = F_3 - \frac{pt}{n}$$

where pt is physical thickness at maximum addition point.

$$F'_3 = \frac{1000}{f'_3}$$

$$F_4 = F_3 + (BVP)$$

$$\text{F.P.O.R. } (r_4) = \frac{1-n}{F_2}$$

CLAIMS

1. Power in the reading area will increase gradually.
2. there is no sudden jump from distance to the reading portion.
3. This lens design allows the wearer to look above and below the eye level for close distances.
4. The gradual power is concentric which fulfills the claim no 3.
5. Lens can be made to any perameter without restrictions.
6. The lens design allows the fitter to determine any central clearance and edge clearance without compromising the fitting of the lens.
7. The lens design allows the fitter to increase or decrease the graduation of power in the reading portion by varing the edge lift of the lens.
8. The back central optic radius and the periphery have no sharp transition so there is no damage to the cornea.
9. The adaptation period for the wearer is no longer than the single vision contact lens.
10. There are no aberrations in the lens as it is made from one piece of material.

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